INTEX-B: Flight 4 (Science Flight; March 9, 2006; Thursday)

This was the second INTEX-B science flight conducted from Houston. The meteorological conditions had become favorable for the sampling of the Mexico City pollution outflow. The main objectives of this flight were sampling of outflow from Mexico City to the Gulf of Mexico and satellite validation. Flight plan was designed to be of most benefit to TES and OMI but also of substantial value to MLS, AIRS, and SCIAMACHY. The flight was coordinated with the NSF/NCAR C-130, who had sampled these air masses the previous day, to further investigate aging of this pollution. The nominal flight tracks and profiles are shown in the slides below but these were modified in-flight to take advantage of specific opportunities. Takeoff time of 8:35 am (LT) was dictated by the 13:15 pm (1915 UT) flight overpass of Aura. Total flight duration was 8.5 hours.

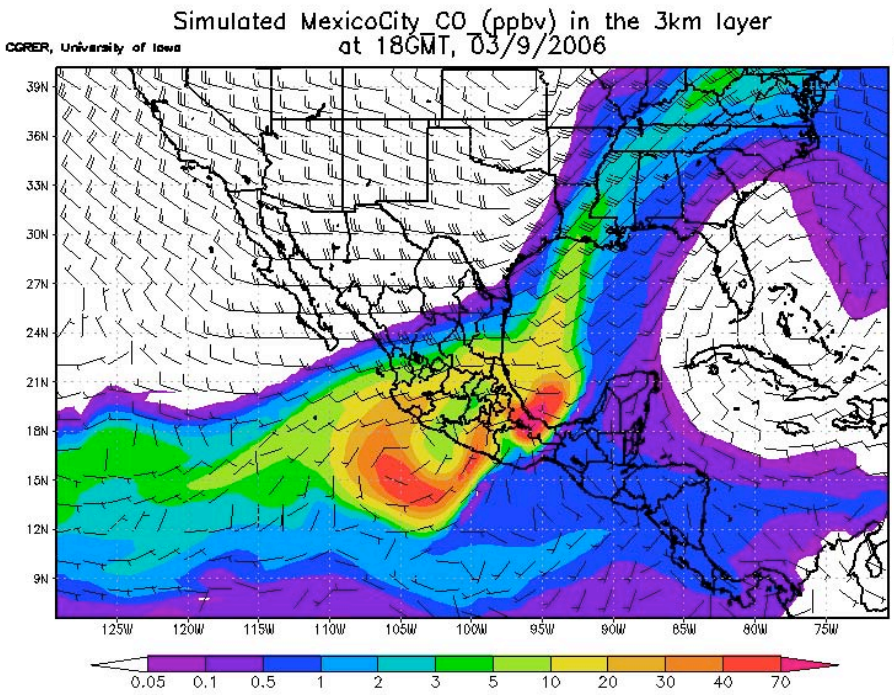
All but one of the instruments aboard the DC-8 performed normally throughout the flight. The GT-LIF instrument is still not operating but some progress is being reported. An advancing cold front triggered rain showers in the local area. The precipitation was aided by a vigorous mid-tropospheric short wave trough just to our west as well as a strong jet stream. The front passed Ellington shortly after take off, bringing westerly winds and clearing skies during the day. The high pressure ridge that had been over the Midwest had begun to move east, replaced by the above mentioned trough. This changing flow was beginning to transport Mexican outflow off the coast and over the Gulf of Mexico. Slide 2 show model forecasts of this outflow from the STEM model. The near shore waters off Texas contained deep convection and multiple levels of mid and high clouds. Most clouds dissipated as we moved east and south. However, broken cirrus were present over much of the flight area.

At takeoff we climbed to 27 K ft, above the cloud tops, and headed south along track 2-3 (see slide 3). As we moved south and descended we encountered Mexican pollution outflow at about 4 km. A thick layer (0-4 km) of pollution emanating from the Mexico City region was sampled. The pollution levels were not unusually high as CO and O3 mixing ratios did not exceed 210 ppb and 75 ppb, respectively. NO2 and HCHO were also in the range of 1-3 ppb. At the lowest levels (0.5 Kft) the air masses had unusual composition and contained high amounts of CH4 (2.1 ppm) and CO2 (400 ppm) with occasional spiking of HCHO reaching 10 ppb. We expect that natural gas combustion and seepage may be a source. We sampled the air over the Gulf of Mexico both below and above the pollution layer as we moved in the north easterly direction. Due to clear skies we were able to get a full lidar curtain of O3 and aerosols across the Gulf. We rendezvoused with the TES satellite track at 37 Kft and spiraled down to 0.5 Kft coincident with the TES Global survey mode . This was also near the Nadir point of OMI and within the SCIAMACHY nadir swath and permitted validation of species such as CO, O3, H2), NO2, HCHO and aerosol. The area of the satellite underpass contained broken cirrus. From this south easterly point we headed east to sample the low level Mexican outflow all the way to the coast line. It became clear that much of the outflow was at rather low levels (<4 km) spread over large areas of the Gulf. Moving northeast from the coast we porpoised above and below this outflow. A highly depolarized aerosol layer (>20%), probably containing Asia dust, was sampled at 8 Kft. We returned to Houston at a low altitude (1-2 Kft) that permitted sampling of urban pollution useful for satellite validation and source modeling. Overall, this was a very successful flight that accomplished all of the planned science objectives and encountered interesting new phenomenon.

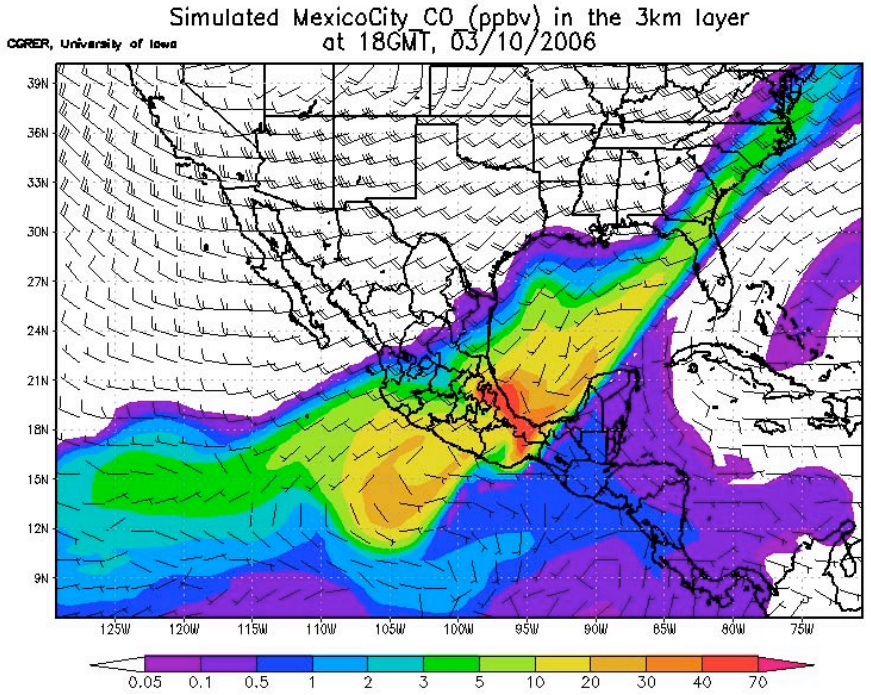
ICATS archived data files for INTEX-B are available at: http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/ICATS/FY06/INTEX-B/index.html

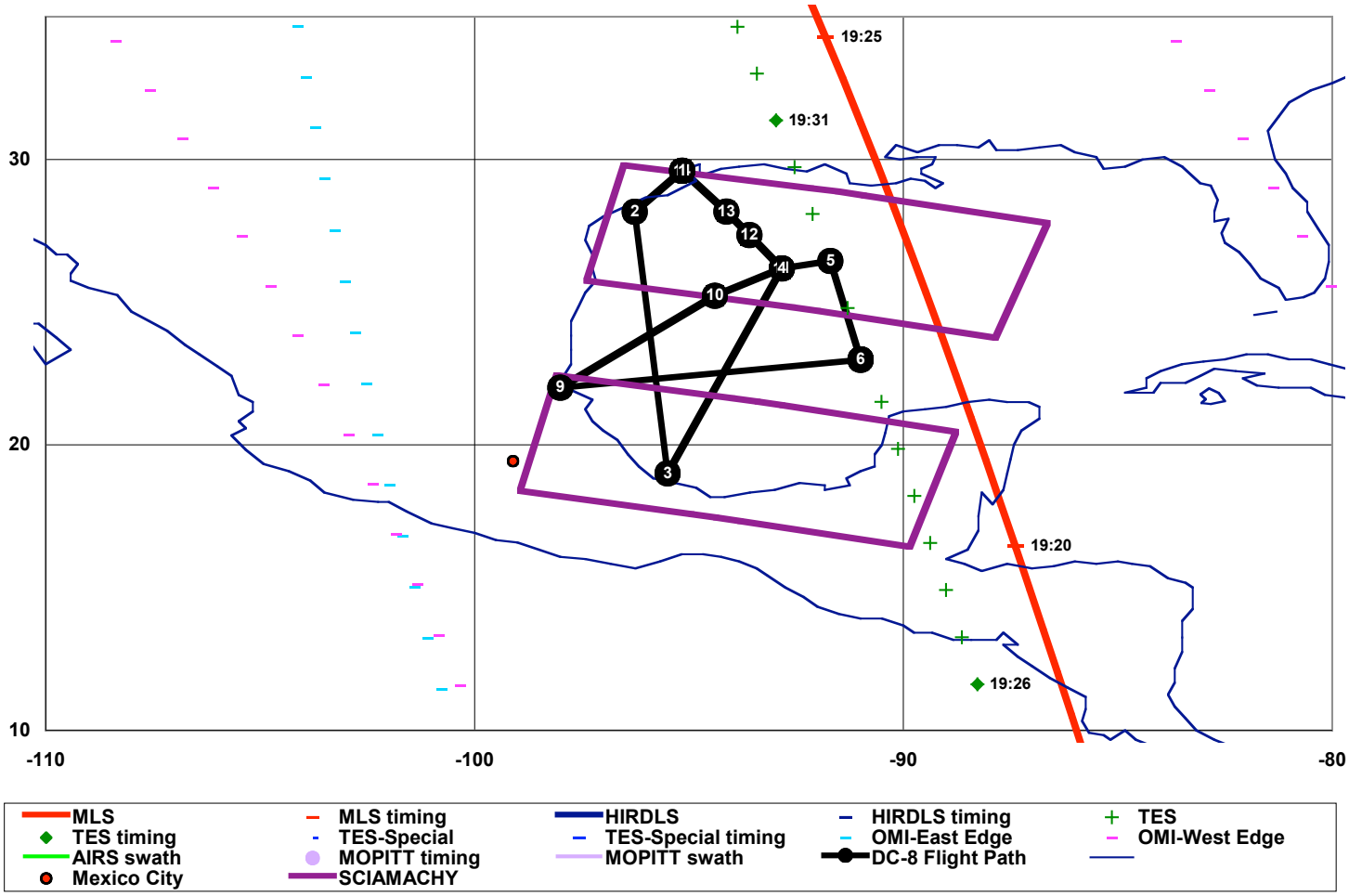
STEM Forecast for Mexico City Pollution Outflow

Thursday 3/9: 3 km layer



Friday 3/10: 3 km layer

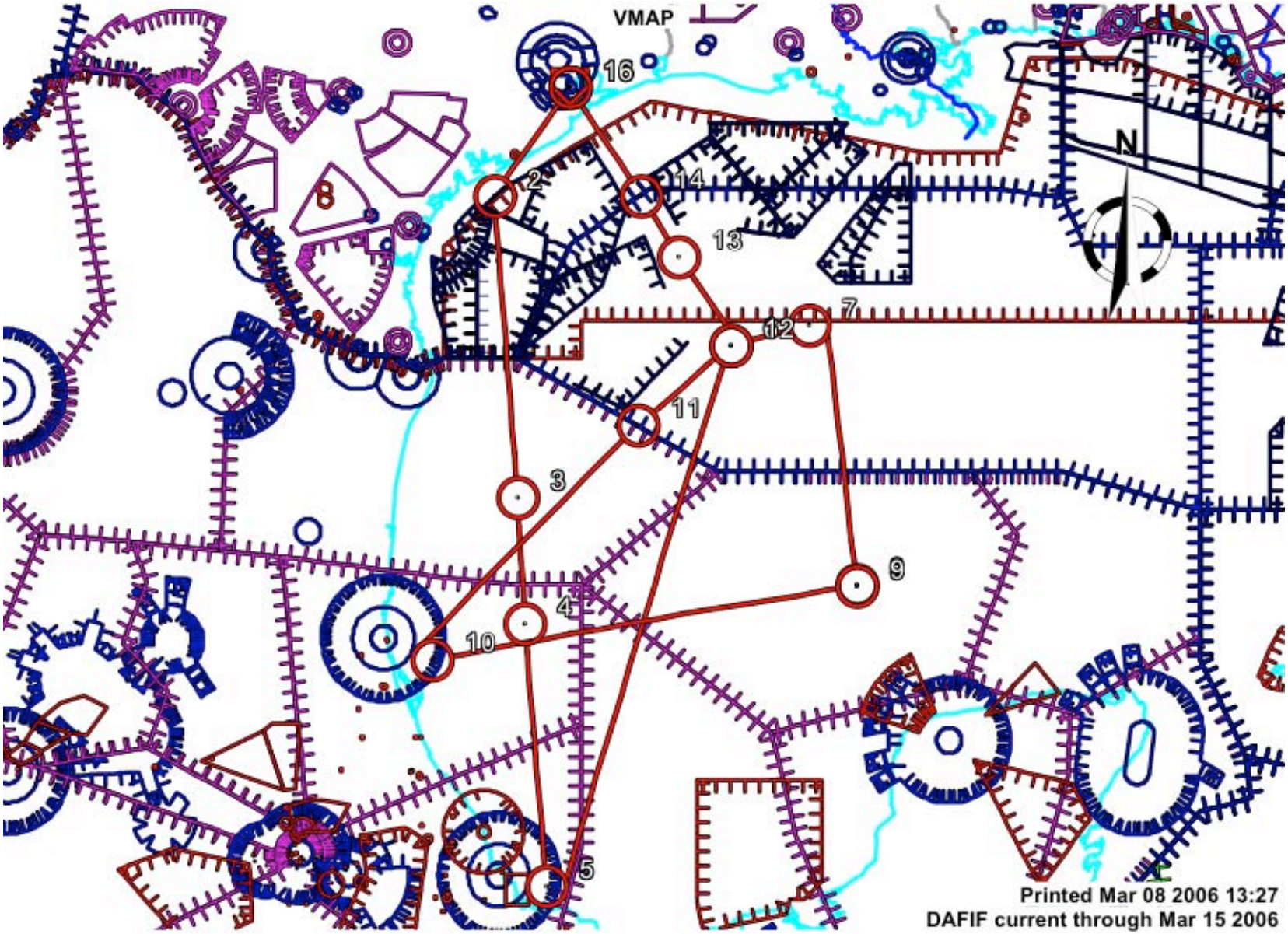




Objectives:

1. TES/OMI validation
2. Sampling of aged/fresh outflow from MC

Flight No. 4:
9 March 2006 (Thursday)
Takeoff: 0900 hrs
Flight time: 8 hrs


VMAP
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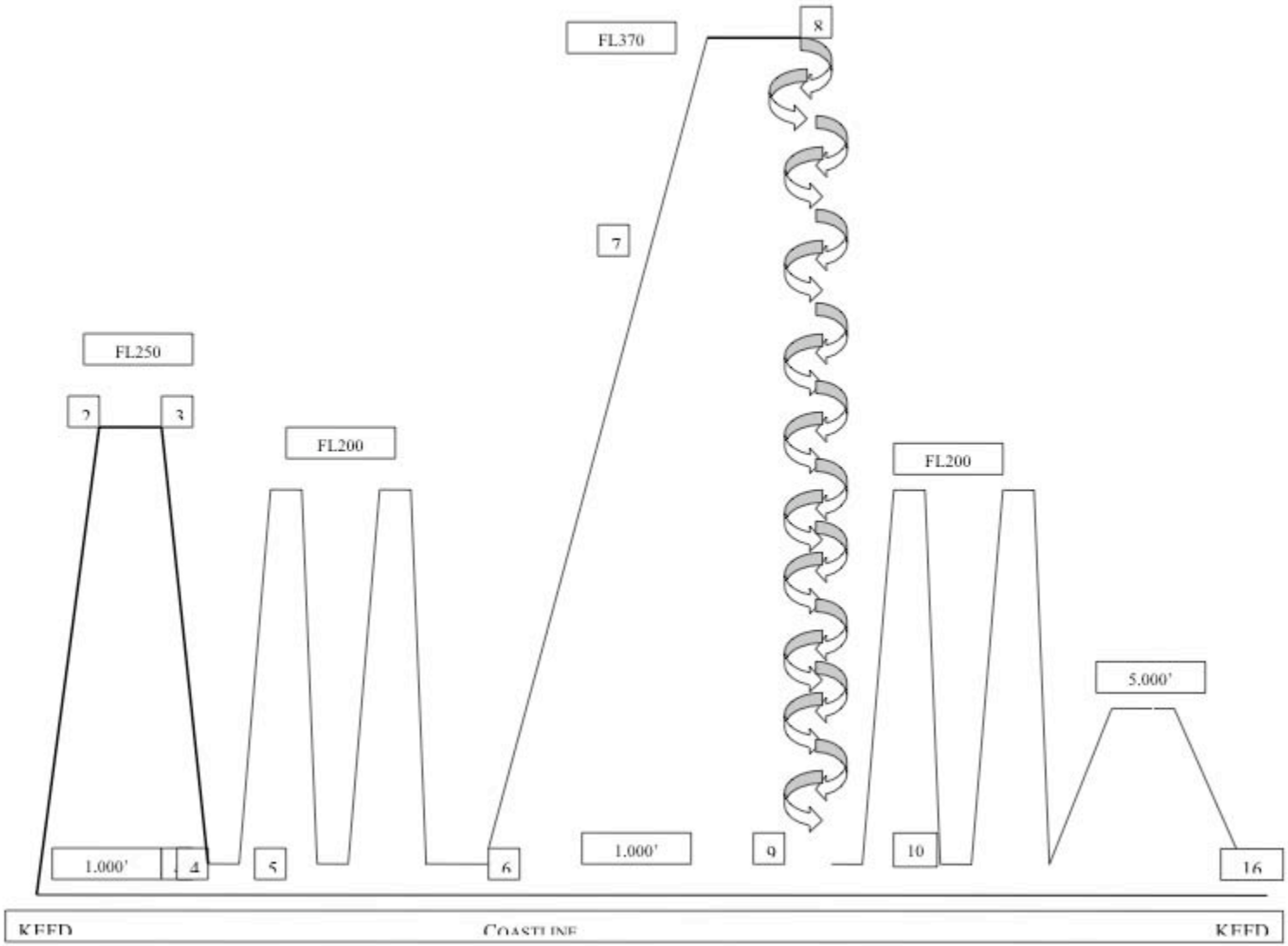
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FL200
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KEED
COASTLINE
KEED

INTEX-B 3 PM Science Team meeting 3/8/06

- Overview of activities & status (Singh)
  - DC-8/Satellite/C-130/G1/J-31 status
  - DC-8 plans
- Met Overview (Fuelberg)
- Flight planning
  - Model products (Jacob/Crawford)
  - Inter-comparisons during INTEX-B (Brune)
- Brief presentations (5-8 minutes each)
  - in-situ measurements (Fried/HCHO)